

Information Asymmetry in Cotton Markets in India

A Paper on Market Orientation

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I. Introduction

India is the second largest producer of cotton in the world accounting for 21% of world cotton production¹. Even with only half the world's yield, cotton and its products in India create substantial income and employment in both agriculture and industry, while contributing to 58 percent of the country's total fiber consumption. However, poor cotton quality has been the other major constraint in developing a globally competitive cotton sector. In the last few years, with the changes occurring in the regional and international markets and growing demand for quality products, the cotton sector and larger textile enterprises have begun to look at imports for sourcing the quality cotton.

Good quality of raw cotton, low in trash and contamination, is one pre-requisite in producing high quality textiles. Although Indian cotton is considered superior to mechanically harvested cotton in terms of sheen of finished fabric, amenability to spinning, tensile strength etc; its value and acceptance in the international market is limited due to high levels of contamination and trash which leads to lower yarn realization and high levels of yarn impurities and imperfections. The contamination of cotton takes place at farm as well as in the market/ginners level as result of poor practices like improper handling and storage, mixing of different picks and varieties of cotton and also deliberate addition of foreign substance in cotton.

For many years, the Indian cotton textile industry has been competing in the international markets mainly on low priced raw materials and low cost of production. Adequate attention has not been paid by the industry to quality mainly due to the sector's high domestic market orientation. In the recent years, growing opportunities for cotton textiles in the international market and the ability to access technology through liberalized trade laws have provided impetus to expand the cotton sector and modernize the textile industry. However, substantial improvement in quality need to be brought about through reforms in the existing market systems.

In recent years, the need for quality cotton in integrated textile mills that focus on the export segments has been gaining urgency. As a result of a short supply of long-staple contamination free cotton from the Indian markets, the industry has come to rely on the import of cotton to meet their requirements. In 1999-2000, the country imported an estimated 2.2 million bales of cotton, more than 100 per cent increase from the 1.0 million bales that arrived the previous year. This increased further to 2.4 million bales in 2001-02. Though in recent years the quantity of imports has gone down to half a million bales (2005-06), quality cotton is still a pressing need in the textile industry.

With the development of new market opportunities and a liberalized trade regime through the removal of quantitative restrictions on imports as well as export quota on cotton, the

¹ Source : US Cotton Market Monthly Economic letter January'2008

textile industry today is faced with challenges as well as opportunities. Meeting these challenges and exploiting opportunities require changes and reforms at policy levels to support enhanced productivity and quality improvement at all levels in the textile sector. Also, enhancement of productivity and improvement in quality, particularly at the raw cotton stages would help to ensure larger gains to the cotton producers. Unless productivity and quality are upgraded substantially to match world standards, the Indian cotton economy may come under severe competitive pressure in future.

The problem of cotton quality and cotton contamination are issues that encompasses the entire cotton value chain beginning at the farm level up to the final stages of value addition. This problem arises due to poor transaction practices at the market level, information asymmetry, lack of proper technology and physical infrastructure. The upstream agents in the supply chain, consisting of farmers and traders/ginners, face a problem of information failure and inadequate institutional support. This limits market performance providing poor signals for quality through price, making the benefit from investment in quality is either insignificant or small.

II. Evidence of Markets Failure

The evidence of market failure is seen in both in the international as well as the national cotton markets. Indian cotton is considered to be among the most contaminated in the world, according to the International Textile Manufacturers Federation (ITMF). As a result of this Indian cotton is sold at a discount compared to similar international varieties. Due to this, the Indian cotton segment has not developed according to the quality needs of the international markets, thus giving it a disadvantage in textile trade as it cannot convert its inherent advantages of abundant raw material and cheap labour it benefit.

2.1 Fiber Contamination, Indian Cotton and the World Market

Indian cotton is considered to be one of the most contaminated cotton in the world. An Indian cotton bale (170 kg) would typically contain contaminants like human hair, jute fibers, metal, scrap, woven plastic, plastic film etc. According to the Contamination Survey conducted by ITMF, in 1999 (table 2.1) out of the 10 most contaminated varieties of cotton, six were from India. This was an increase from four in 1997. The 2005 survey showed the problem of contamination persisted. In a list of the ten most contaminated cottons in the world, five were from India. In 2007, six of the most contaminated cotton in the world was from India.

Table2.1: Worlds Most and Least Contaminated Cotton (2007)

Most Contaminated			Contamination (%)	
Rank	Description		Moderate	Serious
<i>2007</i>				
1	<i>Turkey</i>	Cukurova	40	16
2	<i>Turkey</i>	Turkey others	41	10
3	<i>India</i>	MCU5	27	19
4	<i>India</i>	DCH	31	13
5	<i>India</i>	J34	29	11
6	<i>India</i>	Shankar	24	14
7	<i>Paraguay</i>	Paraguay	13	23
8	<i>Nigeria</i>	Nigeria	28	8
9	<i>India</i>	Others	21	12
10	<i>Uzbekistan</i>	Long staples	22	8
<i>2005</i>				
1	<i>Turkey</i>	Cukurova	40	16
2	<i>Turkey</i>	Turkey others	41	10
3	<i>India</i>	MCU5	27	19
4	<i>India</i>	DCH	31	13
5	<i>India</i>	J34	29	11
6	<i>India</i>	Shankar	24	14
7	<i>Paraguay</i>	Paraguay	13	23
8	<i>Nigeria</i>	Nigeria	28	8
9	<i>India</i>	Others	21	12
10	<i>Uzbekistan</i>	Long staples	22	8
<i>1999</i>				
1	<i>China</i>	Others	63	25
2	<i>India</i>	F-414	53	11
3	<i>Pakistan</i>	Seed Afzal	23	26
4	<i>India</i>	J34	32	16
5	<i>Pakistan</i>	Others	23	25
6	<i>India</i>	Others	27	16
7	<i>India</i>	LRA	28	13
8	<i>India</i>	Shankar 4/6	25	16
9	<i>India</i>	H4	26	15

Source: International Textile Manufacturers Federation survey

Table 2.4 shows that Indian cotton has a high percentage of contamination as well as a large range of contamination compared to foreign cotton (table 2.5), resulting in higher processing costs for buyers. Internationally it is said that buyers quote 10-15 % lower price for Indian cotton due to high levels of contamination

Table 2.4: The levels of contaminants in Indian cotton

Variety/Hybrid	Trash Content (%)	Range
Indian Cottons :		
RG-8	6.4	5.6-6.9
V-797	13.7	12-18
G.Cot.13	15.5	15.2-15.8
Jayadhar	5.4	3.3-8.6
J-34	5	4-6.5
NHH-44	3.7	2.8-5.2
LRA5166	4.2	1.9-10.6
H-4	3.5	1.9-6.2
H-8	5.8	-
Shankar-6	3.8	1.7-8
DCH-32	4.1	2.8-7.7

Source: International Textile Manufacturers Federation survey (2005)

Table 2.5: The levels of contaminants in foreign cotton

Foreign Cottons :		
Australian Cotton(strict middling)	3.1	3.1-3.3
Liba cotton	4.1	3.4-5.6
CIS cotton	4	-
Chinese cotton (superior quality)	1.4	-

Source: International Textile Manufacturers Federation survey (2005)

In the supply chain, there is no mechanism in the market system to address the problem of contamination and it gets carried over to the next stage. It is the spinners who eventually face the realities of extraneous contamination as they deal with the demand and supply for quality yarn. According to the ITMF, in the past 15 years the total levels of contamination worldwide have increased two folds. In order to deal with this problem the spinners usually make considerable investments in technology² to meet the quality requirements despite the risk of not being able to ensure 100% contaminant free yarn (ibid).

2.2 Raw Cotton Price Divergence: Comparison of Indian Cotton Varieties and International Cotton Varieties

In order to study the problem of quality in Indian cotton in context of the markets it is important to assess its performance in the international markets. As a majority of the cotton produced in the country is consumed internally, the markets have not developed at par with the international markets emphasising on standards and quality. This has led to divergence in the quality of cotton in India and international markets, evident in the price differences between Indian cotton and comparable international varieties transacted in the world market.

² In order to tackle the problem of contamination many mills invest in high capital technologies like blow rooms and winding machines that help to remove trash from cotton. However, these processes reduce yarn quality as it weakens it and increases breakage (Vijayshankar, Sukarmadji 2005).

To assess how quality differences exist between Indian and international cotton, we compared prices of Indian cotton with comparable varieties in the international market. Three-year moving averages of adjusted real price series were computed for the comparison. The average difference in price between two varieties between the years 1985 and 2004 (1998 in the case of figure 2.1) was then computed to show the pattern of price movement between these years (table 2.6). Barring the comparison between Giza 70 and DCH 32 all other comparisons showed significant upward slope coefficient, indicating that there is a divergence in the prices for Indian and comparable international cotton varieties. That is Indian cotton gets a comparatively lower price now compared to say, last decade. This is certainly an indication of market failure

Figure 2.1: Comparison of Price Variations for Indian and International Cotton

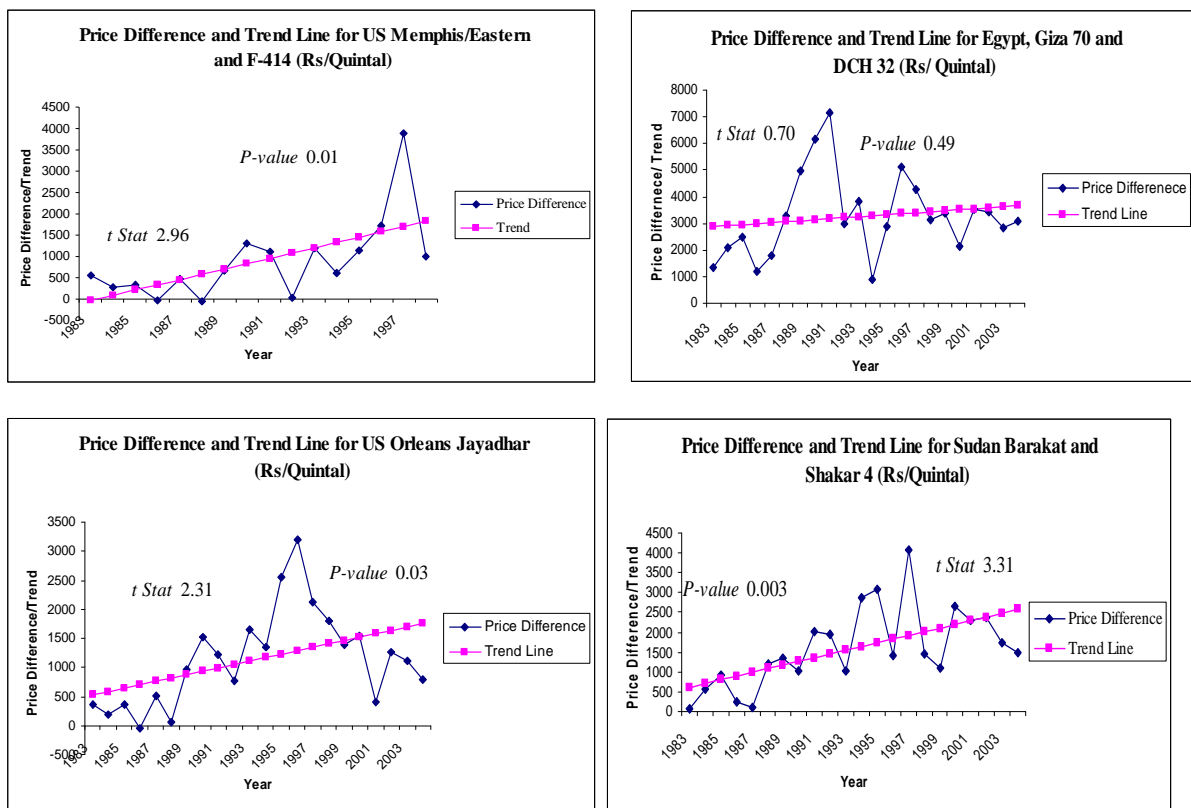


Table 2.6 shows the average price difference between the different varieties of cotton compared above. The price difference in most varieties shows an increase by 200-300% in the years between 1990-94 and 1995-99. Though there is a slight reduction in the differences in the years 2000-04, it is not substantial in two out of three cases. This goes to show that Indian cotton in the international markets has been receiving a lower price because of persistent low quality.

Table 2.6: Average Price Difference for different varieties of Indian and International cotton

Varieties	Average Price Difference 1985-99	Average Price Difference 1990-94	Average Price Difference 1995-99	Average Price Difference 2000-04
<i>US Memphis/Eastern and F-414</i>	269.52	777.20	1658.44 (1995-98)	.NA
<i>US Orleans/Texas and Jayadhar</i>	285.25	1145.53	2198.86	1147.26
<i>Egypt, Giza 70 and DCH32</i>	2227.46	4703.50	3476.45	3070.11
<i>Sudan Barakat and Shankar4</i>	584.47	1591.73	2434.99	2047.63

The above comparison goes to show the difference in price between Indian and international varieties of cotton transacted. Even in the regional markets, the problem of quality in the recent years has emerged to be a pressing matter that needs to be addressed urgently. Despite Indian being the second largest cotton producer in the world, in value added segment like yarn fabric and garments there seems to be a surge of imports in recent years.

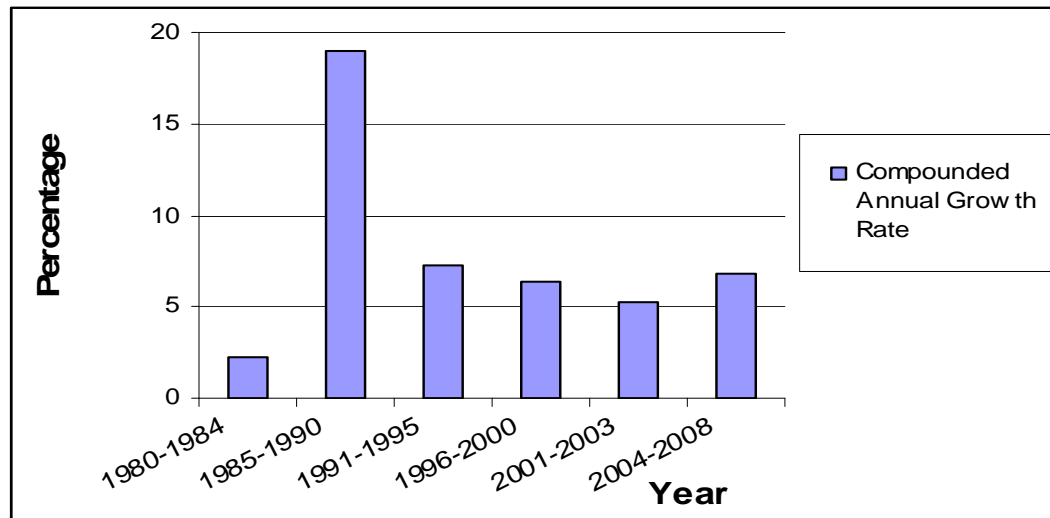
2.3 Quality Constraints in the Final Market Segment

The Indian cotton textile and garment industry has historically been of prime importance to the country's economy. It accounts for 14% of its industrial production, 4.3% of its GDP and 16% of the total merchandise export. The industry also accounts for 90% of the Indian textile exports and 57% of the domestic fiber consumption. It has been the second largest employment generator after agriculture, providing direct employment to over 35 million people (ICRA Sector Analysis, 2006). The textiles and clothing market in India in 2004 was estimated to be 4.25 trillion rupees with 61% of it being domestic, 9% technical textiles and the remaining 30% being exports (ibid).

Despite its large size, the industry has not been able to consistently compete at the international level for a long time. The main reasons for this have been the existence of labour restrictions, high excise tariffs, cloth sale obligations as well as plant size regulations, which have hindered the growth and development of integrated mills at the cost of aiding the growth of small-scale non-integrated mills and apparel enterprises. In the mid-1960s, India was the eighth largest exporter of textiles in the world (UN Statistics 2005), however, restrictive internal regulations over the next decade led to a decline in the share of textile exports. Policy reforms in the 80's and the 90's in the textile sector saw the exports recovering at a steady pace. Reforms allowed the de-regulation of state controlled textile industries, diversification of fabric and fibre bases and increased investments by the firm. It also encouraged duty-draw back programs and technical modernization through increased availability of credit. By the mid 1980's the export figures of textiles had risen to \$1 billion from \$30 million in 1970s at a CARG of

19% (Tewari, 2005). In 2003 the Indian textile exports had reached \$6.8 billion and in 2008 it touched \$20.5 (Ministry of Textiles, 2005)

Figure 2.2: Compounded Annual Growth Rate of Apparel Exports (1980-2008)

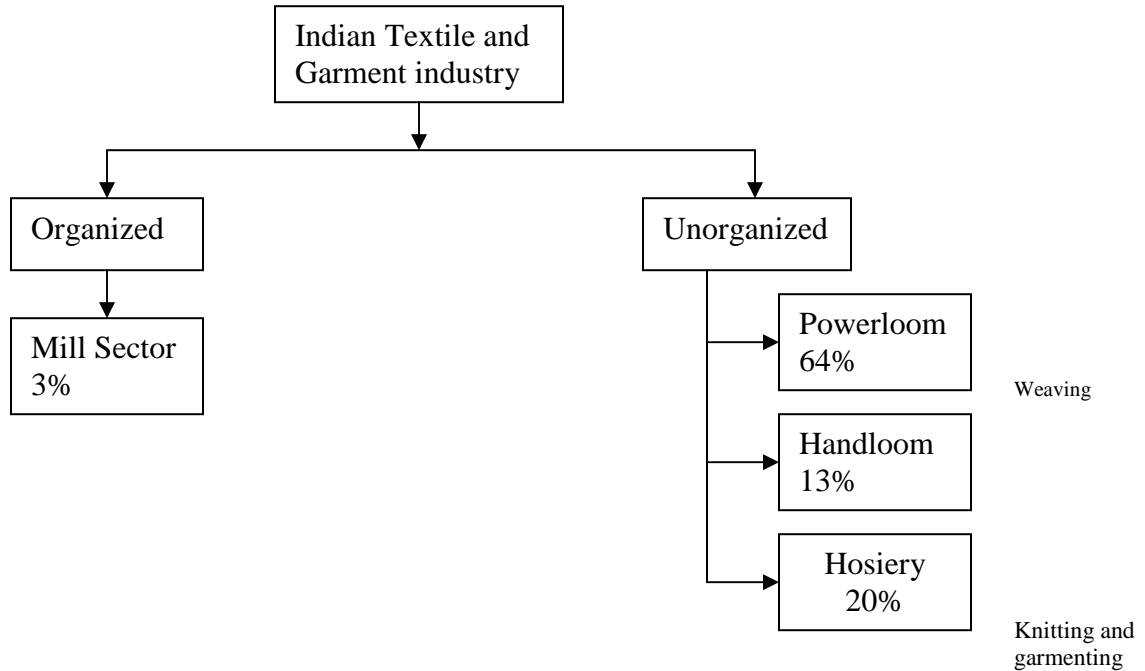


Source: calculated from UN statistics, table 4 Chatterjee and Mohan (1993) and Tewari (2005).
Trade value in current US (million), deflated by CPI index base 1995 (Source WDI).

The integration of the textile and clothing sector into the framework of the WTO brought about mixed implications in textile trade for different countries, creating both winners and losers as domestic markets opened up to competition (ibid). For developing countries like India and China who have the advantage of low cost production and the capacity to scale-up, the post MFA regime was seen as an advantage. In the post MFA era, the share of exports from the developing countries increased while the shares of export in textiles from developed countries decreased.

The inherent problems with the final segment of the supply chain and its inability to develop according to the quality needs of the market are evident in the structure of the textile industry. The textile industry in India is characterized by the presence of small-scale non-integrated spinning, weaving and knitting and cloth finishing units, which are labour intensive in nature. Figure 2.3 depicts the structure of the Indian Textile and Garment industry and the break-up of the source of textiles in India. The decentralized powerloom and hosiery sector is the biggest segment in the Indian textile industry as it accounts for the largest figures in terms of employment, exports as well as fabric production (84%). The mill sector presently makes-up only 3% of the total fabric output and mainly caters to the export and quality sensitive market. The figures of mills share in total textile production had fallen from 70% in 1950 to the present level as a result of unfavourable policies. The decentralized sector, which saw growth during this period, is however characterized by low productivity due to lack of modernization, stagnation due to the inability to expand in the export market and also increased cost of inputs in production.

Figure 2.3: Structure of the Indian Textile Industry and Source of Fabric (in %)



2.3.1 Technological Constraints and Quality

Low technology adoption in India has to a large extent hindrance the development of quality in the textile industry. The main reasons for this have been the small size of various segments of the industry, labour restrictions that restricted loom capacity, poorly developed textile machine industry and production restrictions like the hank-yarn obligation. As a result of this, over the past few years the expansion of segments that emphasise on quality have been limited. The large scale integrated mills have been the only segment that have been able to access capital intensive technology helping them upgrade and scale-up production according the needs of the changing markets. Table 2.7 charts out the extent of low level of technology adoption across various segments of the textile industry.

Table 2.7: Low level of Technology Adoption in India

Segment	Level of Technology Adoption
<i>Spinning</i>	Near obsolete-almost 65% of Spindles over 10 years old OE rotors account for only 1.3% of total spindles
<i>Weaving</i>	only 2.24% of the looms are shuttleless; most units have less than 20 looms
<i>Processing</i>	Low-end dyeing and finishing machinery; numerous hand processors
<i>Garmenting</i>	simple sewing, embroidery machines; numerous manufacturing units with less than 20 machines

Source: Dun & Bradstreet, Indian Textiles & Garments Industry, 2008

The use of outdated technology adversely affects the competitiveness the textile industry in the global markets. Technological upgradation would help to bring about changes in production, quality improvement in output as well as provide proper feedback to lower levels of the value chain. It would also help reducing production time and facilitating economies of scale helping the industry become more competitive in the international markets.

The post MFA regime in textile trade, the sourcing of raw materials from the world markets have become easier with the easing of tariffs and quotas. In this scenario, even countries that are self sufficient in cotton, like India, have the option of looking at international trade to procure cotton and cotton products based on their quality parameters and requirements. This in many ways help keep exports competitive using the inherent production advantages, despite the shortage of quality cotton in the regional markets. Tables 2.8 and 2.9 shows the exports and imports of these cotton segments along with India's share and the its percentage to the world exports/imports.

Table 2.8: Cotton (52)

<i>Recent Import Years in the selection</i>			
Period	Trade Value (bn \$)	India's Imports (mn \$)	% of World Imports
2006	39.57	464.24	1.17
2005	39.38	439.82	1.12
2004	42.76	429.55	1.00
2003	38.31	47.79	0.12
CAGR	0.81	76.53	76.70
<i>Recent Exports Years in the selection</i>			
Period	Trade Value (bn \$)	India's Exports (bn \$)	% of World Exports
2006	46.17	3.91	8.48
2005	43.99	2.99	6.81
2004	44.08	2.09	4.76
2003	41.64	2.43	5.85
CAGR	2.61	12.61	9.72

Table 2.9: Articles of apparel and clothing accessories, knitted or crocheted (61)

<i>Recent Import Years in the selection</i>			
Period	Trade Value (bn \$)	India's Imports (mn \$)	% of World Imports
2006	133.43	24.93	0.02
2005	122.34	17.40	0.01
2004	115.60	10.32	0.01
2003	102.69	10.78	0.01
CAGR	6.76	23.30	18.92
<i>Recent Exports Years in the selection</i>			
Period	Trade Value (bn \$)	India's Exports (bn \$)	% of World Exports
2006	128.60	3.61	2.81
2005	111.70	3.20	2.87
2004	109.73	2.47	2.25
2003	92.67	2.66	2.88
CAGR	8.53	7.85	-0.61

Though the imports of cotton and cotton products from the world markets in terms of volume and percentage have been small, there has been an increasing trend since 2003 in various segments. This is especially true in the case of raw cotton (Table 16), which has reported a CAGR of 76.53%. RMG's have also show an increasing trend in terms of imports in the reported years. The higher value segments of RMG's have not shown high growth (Tables 2.10). In fact, with respect to percentage of world share, the apparel segment has shown a negative growth of CARG – 0.61.

In order to observe the trends in trade in the world garment sector, the study identified seven sub-segments of garments and observed the patterns of change in these segments with regard to the performance of India. Table 2.10 shows a selected segment of RMG with India's share in exports and growth rate from 2003 to 2006. The various segments arranged according to size of exports show that the percentage share of India in the large segments of garments is small. In the small segments like the women's/girls knitted blouses and shirts, the share of India is high.

Table 2.10: Size of Export Market of Selected Segments of Textiles and India's Share and Growth

Segments	Size of Export Market (billion \$)		India's Share in Exports (%)		Growth in Share (%)
<i>T-Shirts/Singlets (610910)</i>	14.35	19.95	6.12	6.83	2.78
<i>Men's/Boys Trousers & Shorts, Woven (620342),</i>	12.97	15.24	1.53	2.75	15.78
<i>Women's/Girls, Shorts, Trousers, Woven (620462)</i>	12.33	16.29	1.18	1.64	8.57
<i>Women's/Girls Blouses, Shirts, Woven (620630)</i>	3.59	4.75	17.41	19.93	3.43
<i>Men's/Boys Shirts, Knitted (610510)</i>	3.09	4.08	12.11	8.83	-7.59
<i>Women's/Girls Blouses, Shirts, Knitted (610610)</i>	3.06	3.97	6.61	7.31	2.54
<i>Babies Garments, (611120)</i>	2.69	3.64	4.35	5.55	6.28

Comparing the competitiveness of the textile and garment industry in selected countries based on parameters relating to technology, policy environment and structure of the industry (Table 2.11), China appears to be competitive in all sectors of the textile industry except in design capabilities as their production patterns are largely based on economies of scale. Though India has an advantage in the textile and garment sector with respect to availability of skilled labour and labour cost, its poor infrastructure and logistics along with poor quality cotton affects its competitiveness in comparison to countries like Turkey, Vietnam, Indonesia and Sri Lanka. The small scale and domestic orientation of the industry and the inherent problems in the supply chain like the quality of cotton has led to a market failure, constraining the development of economy of scale and scope for higher investments into the sector that have the potential to develop.

Table 2.11: Textile and Garment Industry in Selected Countries

Particulars	India	China	Pakistan	Hong Kong	Sri Lanka	Bangladesh	Vietnam	Indonesia	Turkey
<i>Raw material availability</i>	Good	Good	Good	Poor	Poor	Poor	Poor	Good	Good
<i>Integration level</i>	Low	High	Medium	High	Medium	Low	High	High	Medium
<i>Technological application</i>	Low	High	Low	High	Low	Low	Low	Medium	High
<i>Processing</i>	Poor	Good	Poor	Good	Average	Poor	Average	Poor	Good
<i>Skilled labour availability</i>	High	High	High	High	Medium	Low	High	High	High
<i>Labour cost advantage</i>	High	High	High	Low	High	High	High	High	Medium
<i>Design capabilities</i>	Good	Poor	Average	Good	Poor	Poor	Poor	Poor	Average
<i>Infrastructure</i>	Poor	Good	Poor	Good	Average	Poor	Poor	Average	Average
<i>Government policies</i>	Partly restrictive	Supportive	Supportive (except polyester)	Open, unrestrictive	Supportive	Supportive	Supportive	Neutral, unrestrictive	Supportive
<i>Investments</i>	Rising but still low	High	High	Declining	Medium	Medium and growing	High	Declining	Low but grown largely in 2005
<i>Textile machinery industry</i>	Moderately developed	Medium-good	Poorly developed	Good	Poorly developed	Poorly developed	Poorly developed	Poorly developed	Poorly developed
<i>Logistics/supply chain</i>	Poor	Good	Poor	Good	Good	Poor	Poor	Average	Average
<i>Preferential access</i>	GSP benefits of EU & US	No	Beneficiary of EU GSP but not GSP plus	Chinese market	EU	EU, US, canada japan	GSP benefits of EU & US	Beneficiary of EU GSP, ASEAN members	EU
<i>Strong segments</i>	Home textiles, garments(a)	Almost all T&G segments	Home textiles (cotton towels and bed linen)	Garments	Garments	Low cost garments	Garments (a,b)	Manmade fabrics and fabrics	Garments, made-ups (especially carpets)

Source: Source: Dun & Bradstreet, Indian Textiles & Garments Industry, 2008

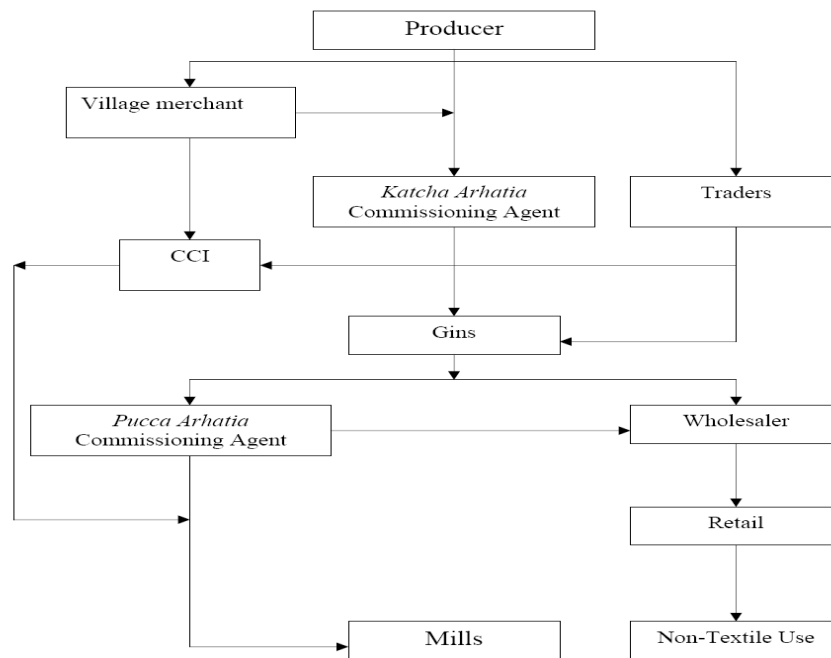
(a) = cotton based, (b) = MMF,

Note *GSP= Generalised System of Preference, "The U.S. GSP, is a program designed to promote economic growth in the developing world, provides preferential duty-free entry for about 4,900 products from 132 designated beneficiary countries and territories. The GSP program was instituted on Jan. 1, 1976, and authorized under the Trade Act of 1974 for a 10-year period. The GSP Program is currently authorized through December 31, 2009". (<http://www.ustr.gov>)

III. Reasons for Market Failure

In the absence of grading and standardisation, there emerges a problem of information asymmetry in the market as buyers and sellers possess different levels of information during transactions. Akerlof (1970) states that information asymmetry among producers and consumers make it hard to determine the quality of the product transacted. In this absence of information, consumers assume the quality of the products sold is low as a result of the mixed quality of the product that is available. This shifts the perceived quality of the product towards low quality resulting in the ‘lemon problem’, where the low quality goods drive out the high quality goods from the markets. This leads to adverse selection – a market failure where products are sold at a single price irrespective of quality, leading to too much low quality goods and too little high quality goods.

Figure3.1 Cotton Marketing Chain in India



The three channels through which cotton is marketed in India are; private trade, state-trading and co-operative marketing. The Agriculture Produce Marketing Committee (APMC)³ is the primary market infrastructure in the country for the transaction of commodities. The main functions of these markets or *mandis*, is to regulate market practices like weighing, method of sale, grading and payment. It also provides facilities for storage, boarding and lodging for buyers, sellers etc. For its services, the market charges 1% of the goods value as fees from the buyers. In India, there are 7062 functioning *mandis* today. The cotton marketing chain in India is highly fragmented and is

³ The APMC's were setup by the Agricultural Produce Marketing Committee (Regulations) Act in 1963 as a marketing platform for the sale of primary agriculture products. The aim of the establishment was to provide a regulated market infrastructure for agriculture goods that hitherto did not exist.

characterised by many intermediaries in the form of commissioning agents (*katcha arhatias*⁴ and *pucca arhatias*⁵) and village merchants (figure 3.1).

In a fragmented system coupled with the problem of poor awareness among primary producers and absence of grades and standards has led to the problem of information asymmetry leading to poor price-quality linkages, poor price realisation to primary producers and low awareness of good practices among them.

3.1 Price-Quality Linkage

In order to assess the relationship between price and quality of cotton in the Indian markets 535 cotton samples were collected from different markets of Gujarat, Haryana, Punjab, Rajasthan and Karnataka. The price offered was also collected from the market committees. In order to determine the extent of price-quality linkage prevalent in cotton sales, markets of various cotton growing states were assessed individually. On a given day (supply-demand situation known) the difference in price quoted for different lots should be explained fully by the quality parameters of the lot and therefore, the intra day price variation across lots in the market should fully explain the variations in the quality characteristics. This is consistent with the Lancaster model which says that the price of a product is a function of quality characteristic. That is, if P_i is the price of lot i , C_{ij} is the j^{th} characteristic of the lot i and a_j are the weights, then:

$$P_i = \sum_j a_j C_{ij}$$

Therefore, we should be able to fully explain the intra-day price variation across different lots sold in the market with the help of quality characteristics. If the intra-day variations in price can be fully explained by variations in quality characteristics, we can conclude that the price-quality linkage is strong⁶.

The various quality characteristics used in this analysis as variables were

2.5 Span Length (Len), 50% Span Length (Len5), Uniformity Ratio (UR), Strength (STR), Elongation (EL), Micronaire (MIC), Reflectance, Yellowness, Colour Grade (CG), Floating Fiber Index (FFI), Mean Length (ML), Seed Coat Index (SCI), Short Fiber Content (SFC), Trash and seed coat.

Therefore, to assess the relationship between price and quality, the following regression equation can be estimated.

⁴ The *katcha arhatia*'s usually advances money to the cultivators on a nominal interest with the condition that their produce would be transacted through him. *Katcha arhatia* also charge a commission for services rendered and they form a link between the village cultivator and traders or gins.

⁵ They are the real purchasers in the wholesale market, for themselves or acting on behalf of businessmen, firms in consumer markets. Big mills (rice, oils, cotton etc.) use them as their agent and places orders to purchase certain quantity of produce within a given range of price. When transacting on their own, the *pucca arhatia* procures cotton before selling to various mills in different part of the country.

⁶ There are possibilities of change in demand and supply situation within a day. However, it is not very common in agricultural markets.

The regression model estimated is:

$$P = f(\text{LEN,LEN5,UR,STR,ELG,MIC,Reflectance,Yellowness,CG,FFI,ML,SCI,SFC,Trash,dummy variables})$$

3.1.1 Estimated Model

Table 3.1 shows the model summary for different states. The R^2 of all states are low showing that the price-quality linkages poor.

Table 3.1: Model Summary of the Analysis of different States

Model	Adjusted R^2	Std. Error of the Estimate	f	Prob> chi2
Haryana	.264	8.97	2.67	0.7927
Punjab	.510	81.16	15.18	0.0000
Rajasthan	.646	86.83	25.96	0.3298
Gujarat	.016	271.10	1.34	0.0527
Karnataka	.452	254.13	7.90	0.0000

Analyses of the test data of the 535 samples collected from various markets in the states of Punjab, Haryana, Rajasthan, Gujarat and Karnataka show that the price of cotton transacted in the markets is not a good indicator of the quality of cotton. The quality characteristics at the most explains about 65% of the variation in prices and sometimes hardly any variations. The visual-tactile assessment of cotton to determine its quality before transaction tends to miss the assessment for essential characteristics like micronaire. Due to the large size of the lot and other malpractices in the market by farmers and others, buyers have difficulty in assessing characteristics like trash, yellowness and colour grade which plays a very important role in the processing and yarn-fabric production stages.

3.2 Price Determination in the Absence of Grading and Standards- A Survey of Market Sales and Price Quality Linkages

The informal grading and premium determination in the APMC has led to a wide range of uncertainties in the system of price and quality determination in the markets, which has led to poor signalling and information flow to the lower level of the cotton value chain. The most common form of assessment of quality to determine price in the absence of established testing facilities is often through visual and tactile assessments where price differences are often very high. The prices quoted by different merchants for a particular lot of cotton often have large variations and are not based on test data. Therefore, the price realization for farmers is low as sampling does not determine the characteristics and quality of the entire lot.

The two methods of *kapas* sale practiced in India are the 'open auction system' in Gujarat, Rajasthan, Punjab and Haryana and the 'closed tender system' in Karnataka. In an open auction, market participants openly bid for lots in the market yard which belong

to different commission agents and the lot is sold to the highest bidder. In both these practices there are no limiting conditions or prices. In the closed tender system, cotton is hoarded in the market yards where traders inspect these lots or samples of lots and quote their buying price in sealed envelopes. The envelopes are opened up and the lot is sold to the trader with the highest bidder.

In order to understand the nature of these methods of sale and the impact it has on price determination, a study was conducted in various markets of Gujarat, Rajasthan, Punjab, Haryana and Karnataka to study these practices, the variations of price in bids and how they are often not representative of the actual quality of cotton transacted in the market. An assessment of the variations in bid prices helps us to understand how bidding on subjective assessment is difficult. Even though the samples are only 500 grams, subjective assessment could sometimes lead to significant variations among buyers. These variations reflect one dimension of price uncertainties with respect to quality for the farmers. The other dimension is assessing lot quality. To capture the uncertainty involved in bidding a lot, we have analysed bids of individual lots in a tender system.

The participants of the study in the open auction system were shown the three samples of cotton from three different lots and were asked to quote a price for a quintal based on their assessment. This helped determine the extent of variation in prices due to the absence of grading and premium determination in the market. Table 3.2 shows the percentage difference of the different bids prices for the three samples of cotton that were shown to the traders based on the prices quoted.

In the state of Karnataka, cotton is sold in the market by the closed tender system, where participants mostly comprise of commissioning agents. The commissioning agents are licensed by the market to sell cotton to the trading companies and individual merchants on behalf of the farmers. In these markets, the farmer takes his produce to the commissioning agent's yard for sale. Each trader bids for a lot of cotton under a commissioning agent with quotes in a sealed envelope. At the end of the bidding time the quotes are revealed and the lot is sold to the highest bidder.

In the study, two cotton markets of Karnataka were visited and a bid data for different lots of cotton was collected from five commissioning agents for five consecutive marketing days. The bids for each lot were collected and analysed to determine the standard deviation, mean, range and the percentage of difference in prices for each lot. The average range percentage for each day is given in table 3.3. The observations reveal that the variations range from 7.34% to as high as 66%. In the closed tender system the variations of the bids are much higher than the open auction system in the other states.

Table 3.2: Percentage range (with respect to mean) of prices quoted by Market Participants for three given samples of cotton

State	Market	Percentage Range of S- 1	Percentage Range of S- 2	Percentage Range of S- 3
Gujarat	Amreli	0.85	0.85	2.73
	Botad	1.74	1.22	2.70
	Kadi	0.97	2.04	1.65
	Rajkot	2.69	1.84	2.97
	Karjan	1.58	0.85	1.30
	Bodeli	1.34	0.61	1.42
	Jetour	1.46	2.05	2.65
Rajasthan	Sriganganagar	1.42	1.42	4.81
	Hanumangarh	1.42	4.95	6.65
	Kesrisinghpur	3.84	4.81	2.62
	Padampur	4.79	4.90	9.27
	Anoopgarh	1.42	3.45	2.00
	Raisinghnagar	4.95	5.70	1.42
	Suratgarh	4.78	6.05	1.25
Punjab	Abhor	1.41	0.89	0.83
	Maur Mandi	0.75	0.53	0.64
	Raman Mandi	0.49	0.43	0.86
	Jetu	1.39	0.66	0.6
	Mutsar	1.08	0.45	0.62
	Bhatinda I	0.47	0.58	0.48
	Bhatinda II	0.69	0.51	0.63
Haryana	Hisar	0.27	0.32	0.21
	Dabwalli	0.34	0.22	0.34
Karnataka	Hubli	2.06	2.83	2.52
	Bailhongal	1.18	1.98	1.75

Table 3.3: Average percentage range of Bid Prices (with respect to mean) of cotton on 5 days in two cotton markets of Karnataka

Market	Commissioning agent	Average percentage of variation in bids on five days				
		1	2	3	4	5
Hubli	1	8.01	8.03	11.04	10.90	9.88
	2	9.04	7.64	8.21	11.91	7.79
	3	9.02	8.18	7.54	8.40	10.91
	4	10.03	11.29	8.20	9.25	9.37
	5	7.34	10.46	8.87	11.43	9.25
Bailhongal	1	8.39	13.27	12.19	9.82	11.20
	2	27.68	51.84	35.36	43.66	13.49
	3	33.28	30.57	32.04	32.94	31.88
	4	31.73	64.59	56.38	66.13	67.17
	5	20.87	33.34	32.94	29.62	32.25

The variations in bid prices also indicate that lot quality is difficult to assess though the subjective method and therefore there is a considerable uncertainty about what price the farmers would get for his produce. The high variation in bid prices is mainly due to differential assessment of lot quality by the bidders that are not based on test results. In the case of the closed tender system, where the assessment is done through the inspection of lots rather than small samples, there seems to be a higher variation in price.

3.3 Prevalent Farm Practices in Cultivating Cotton in India- A Survey of Cotton Farmers

In order to study the problem of cotton contamination at the farm level during the harvesting and post harvest stages, a farmer's questionnaire was designed to assess the level of awareness among farmers regarding good harvest and post harvest practices. The farmers levels of awareness on harvesting time, method of harvest, segregation practices, pooling, drying and transportation was assessed. The data from the survey is represented as percentage of farmers in table 3.4. In many cases, farmers practice more than one method of harvest and post-harvest techniques.

Table 3.4: Awareness of good practices - harvesting time (Base=537)

PARTICULARS	Actual practice%	Good Practice awareness %	Good Practices
<i>Harvesting time</i>			
Morning	95	40	Harvesting in the morning and evening when locules are less sticky
Afternoon	95	0	
Evening	95	40	
<i>Method</i>			
Matured	99	40	Pick only mature cotton as locules add to trash
Fiber locules	99	0	
<i>Segregation</i>			
Trash	18	46	All the particulars must be prevented or segregated if they occur to maintain the quality of cotton
Discoloured	70	49	
Immature	55	47	
Diseased	61	47	
Dusty	26	49	
Bird damage	59	49	
<i>Pooling</i>			
On tile pavement	0	29	Pooling needs to be done on concrete or on tiled platforms to prevent contamination
Concrete	0	29	
Heaping on open platform	100	0	
<i>Drying</i>			
Direct sunlight	91	0	Drying needs to be done mechanically or in the shade/partial exposure to maintain reflectance and reduce yellowness
Partial exposure	18	0	
Shade	0	23	
Mechanical drying	0	20	
<i>Transportation</i>			
Cart/truck	95	0	When cotton is transported it needs to be covered properly in closed dust-free conditions
Overhead	0	0	
Motor vehicle	3	21	
Closed containers	0	14	
Dust free	0	14	
Any other	0	0	

Harvesting Time

95% of farmers harvest cotton in the afternoons as well and they were not aware of it as a bad practice.

Method of Picking

Farmers picked fiber locules along with mature cotton at the time of harvesting without being aware it reduced the grade of cotton.

Segregation Practices

the level of awareness of farmers about these contaminants. Only about half the farmers surveyed were aware that trash, discoloured, immature and diseased cotton along with dusty and bird damaged cotton needed to be segregated after harvest. Most often only the discoloured cotton was segregated as they were more visible in a lot. However, in many cases the farmers were aware of contamination and good practices of segregation but did not address it.

Pooling Practices

All the farmers in the sample used open platforms to heap harvested cotton, making it vulnerable to soiling and contamination. Only 29% of the farmers were aware that the use of tile platforms or concrete was a good practice though they did not have the resource to build one for this use.

Drying of Cotton

91% of the farmers surveyed, dried cotton in direct sunlight and only 20-23% was aware of good practices without practicing it.

Transportation of cotton to the markets

The survey shows that 95% of the cotton transported to the markets was done using carts/trucks. However, this is often done without covering the cotton. In the states of Karnataka and Maharashtra carts mostly transport cotton whereas in Punjab, Haryana trucks are used.

From this survey it is clear that the problem of cotton contamination begins at the farm level as a result of poor harvest and post harvest practices. This is a serious concern for producing quality cotton for the markets. Poor practices are a result of lack of awareness as well as the lack of physical infrastructure at the farm level. In some cases though the farmers were aware of good practices they didn't have the resources for the infrastructure pertaining to good harvest and post-harvest practices.

IV. Development and Streamlining of the Cotton Value Chain

With the integration of the Indian supply chain with the world markets, the problems of cotton quality have come to the forefront with a need to transform it. A proper functioning market is a prerequisite for dissemination of information, enabling good market practices and also in assuring transactions based on quality with good price-quality linkages. The existing problems of the market and supply chain would address itself once provisions are in place to regulate and ensure good market practices.

A well functioning market would generate information at all levels to participants, addressing the problems of information asymmetry through the establishment of grades

and standards, warranties to market participants and through signalling. The presence of grades and standards in the markets would act as signals to traders who would have the assurance of quality of the produce they buy. They will also aid farmers to make better pre-harvest and post-harvest decisions.

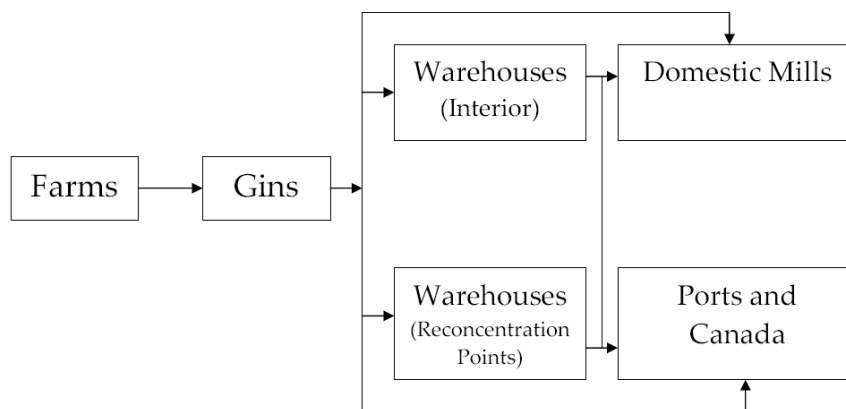
A clear picture of the need for market reforms and the advantages of grades and standards in the market can be brought about through a comparison of the Indian and the American cotton supply chains. The establishment of practices based on grade based transactions; warehousing etc has helped create a well laid out marketing system with information flow to all levels of the markets.

4.1 Cotton Marketing Flow in the United States

The cotton marketing chain in the US has two integral parts to it. It involves a number of physical services like ginning, grading, freighting and storage as well as merchandizing activities like warehousing, transfer of ownership, transaction practices etc (Glade, 1996).

The primary difference with the Indian market chain is that the cotton from the farms are taken directly to the gins where they are cleaned, linted and made into bales of 475-525 pounds each. They bales are then tagged, sampled and weighed before the transaction process begins. The tag contains information of region of produce, variety and quality characteristics can be traced back to the primary producer from any level of the market chain. The cotton bales are then warehoused before being transacted to domestic or foreign mills (ibid). Figure 4.1. depicts the physical flow of cotton from the farm to the end user in the American cotton supply chain. Warehouses are of two types, the interior warehouses where the ownership deed stays with the producer which can be pledged as collateral. The second type of warehouses are used are reconcentration points where the cotton is already sold and destination of the cotton is known.

Figure 4.1: The Cotton Market Chain in the US



Source: The Cotton Industry in the United States, USDA

4.2 Changes in the market system

The existing flaws of the Indian cotton supply chain have been detrimental in achieving premium price realisation in the markets and ensuing a reliable feedback system on quality. American supply chain of cotton has a system of grading and standardising ginned cotton before the product enters the markets. This helps to reduce ambiguities in price- quality linkages and reduce the risk of contamination during marketing stages.

Feedback information to the primary producer at the time of transaction is an important aspect in the marketing chain that needs to be developed. In the existing system, farmers are often not aware of what causes them to get a low market price for their produce and what practices need to be improved in order to get better prices.

Ginning cotton before transaction as depicted in figure 4.2 has many advantages. Primarily, if cotton is ginned, graded and packed before it enters the market; it need not be unpacked and handled at different stages for price and premium determination. The lint would carry the same grade given at the ginning stage to the mills making pricing easy and reduce the levels of contamination during transportation and transaction at different stages of the market. Ginning at the pre-marketing stage by the farmers would help them realise the consequences of trash content and admixtures when their cotton is ginned and graded, as well as empowering them to negotiate a fair price at the marketing stage as a result having information regarding the quality of their produce. Therefore, ginning and grading prior to marketing would help in improving quality and value addition at an early stage that would help in the differentiation between bales of different qualities.

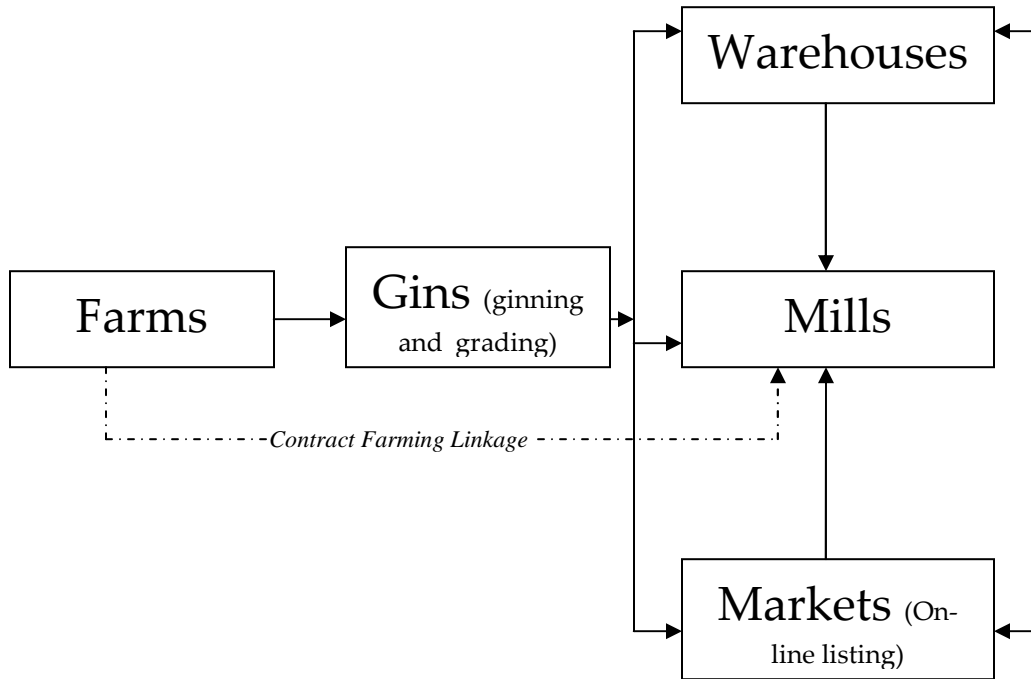
The establishment of grades and standards at an early stage in the value chain would also open up many more marketing and transaction options to the participants in the market. It will enable transaction over long distances, therefore improving competition in the markets as well as reducing intermediaries.

Figure 4.2 depicts the ideal cotton supply chain that can be brought about in India with ginning being carried out at the farmer's level. Cotton would be taken to gins directly from the farms before it enters the market. Once it is ginned and graded by accredited and certified testing labs, the farmer could decide to sell their produce based on the price bids. If the prices are not attractive, the farmers can pledge their produce in warehouses to get short-term credit. For ginned cotton, the amount of credit he/she can get will be increased. The storage option will become attractive for graded products and therefore farmers will have the option of waiting for a better price. The graded cotton could move from the market to the mills or to warehouses for listing in the markets.

Ginning and grading of cotton before the marketing process would also allow the development of a computerised system of transaction in the APMC. The development of the APMC as an online trading platform would help to streamline the marketing process further. Farmers could gin and grade their cotton and list it based on its quality in the

market before storing it. Traders can make buying and selling decision based on the information listed in the market.

Figure 4.2: Cotton Supply Chain with a System of Feedback



In the markets, both traders and primary producers will have adequate information to transact based on quality and premiums. Through this, the farmers will be able to get a remunerative price based on the quality of their produce. The traders similarly will be able to get quality cotton based on their needs, demand of the market and also the demand of their final buyer. The mills also will have the option of buying their cotton directly from the farmers, gins or traders based on their need and the need of the market. This will help to evolve a strong spot market.

Standards and grades will also make available more marketing options for farmers. As a result of feedbacks from the gins farmers will be able to transform farm level practices that will enable him to produce cotton according to the demands of the market. The establishment of warehouses will enable farmers to pledge their produce as collateral for loans rather than selling his produce in the market. Transaction based on grades and standards will also enable farmers to make forward contracts before the cotton season.

In order to facilitate the transfer of gins to the lower levels of the marketing chain, good infrastructure and testing facilities that could handle the raw cotton input coming into the ginnery is needed. Support from the government and the APMC is also essential to bring about this change which would help the gins, market and the farmer in the process of facilitating improvement of cotton quality.

Benefit to ginners:

- Higher efficiency of production as a result of better awareness of price quality linkages
- Better relationship with mills as confidence increases in the quality output of the gins
- Ability to provide efficient feedback as a result of having testing and grading facilities in the ginneries

Benefit to farmers

- Establishment of a system of feedback leading to more awareness regarding price, quality and premiums
- Increased awareness leading to improved cultivation and post harvest practices in order to attain premiums and price realisation
- Value addition at an early stage helping with better prices at the marketing stages
- Better marketing opportunities
- Better access to credit

Benefit to market

- Transaction of better quality cotton reducing ambiguities and increasing efficiency
- Development of standards based on price-quality linkages
- Reduced role of intermediaries determining price in the markets
- Improvement in marketing structure and functioning
- Reduced market time and promptness in payment
- Reduced risk of contamination in the marketing yard
- Reduced handling of cotton as a result of grade, quality being determined before cotton entering the markets
- Information dissemination (Forward and Backward)

V. CONCLUSIONS

In this study we have tried to analyse and understand the problem of cotton quality in India in context of the entire value chain from the farm level to the mills. The problem of quality has been reflected in poor price realisation in the markets, low quality of yarns, fabric and garments as well as low export competitiveness in the international markets, leading to a market failure. The factors contributing to this inherent in the entire cotton supply chain. This problem transcends to the spinning stage where the cost and production of quality yarn, fabric and garments are affected. The impact of quality problems has influenced the export competitiveness of Indian textiles in the international markets despite having the infrastructure, labour and technological advantages in textile production.

The ITMF survey indicates the disadvantages Indian cotton has in the international markets owing to the problems of quality and contamination. In their list of the most contaminated cotton in the world (2007), six in the top ten are Indian varieties. As a result of this, Indian cotton in the international markets are often sold at a discount compared to similar varieties of foreign cotton. Poor quality cotton transcends to all levels of the supply chain affecting all levels of value addition, impacting fiber yarn, fabric and

garment quality. The need for quality cotton to make quality, finished goods that are competitive in the international markets is important for the Indian cotton segment to take full advantage of available international market opportunities in the post-MFA regime of trade. The demand for quality garments have been on the rise in the regional as well as the international markets and this is reflected in the increased export of fabrics and garments to the international markets as well as imports of textile and garments to the Indian market.

The problem of cotton contamination begins at the farm level during the harvesting and post harvest stages. The lack of signalling and information flow coupled with underdeveloped physical infrastructure and expertise aggravates the problem of contamination further at the marketing and ginning stages. The survey of farmers reveals that the problem of contamination begins at the farm level, as a result of poor harvest and post-harvest practices. The prevalence of these practices is often a result of the lack of awareness, information flow and feedback to the farm level. The problem gets aggravated due to the lack of adequate infrastructure at the farms, markets and ginning. At the market level, the absence of grading and premium determination leads to poor price realization for farmers. Pricing methods are often ambiguous, as traders often use subjective methods to assess cotton quality and determine price. This has resulted in poor price realization to the farmers, as price quoted by traders are often not based on proper quality assessment of lots. The analysis of price-quality linkage done based on the data collected from the states of Punjab, Haryana, Gujarat, Rajasthan and Karnataka substantiates the market survey findings that price-quality linkage is often weak. This indicates high uncertainty of getting high price for better quality produce.

The nature of institutional set ups, transactions and practices at the different levels of the cotton supply chain do not provide incentives to produce quality. The lack of an efficient feed back system at all levels of the cotton chain hinders information flow and scope for change in practices needed to improve the quality of cotton. In this situation, it is the mills that bear the brunt of poor quality cotton as it impacts the production of quality yarn and fabrics. The textile sector being a major export segment in the economy, production of quality cotton has an impact on export competitiveness of yarn, fabrics and textiles, a major export segment.

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